Attorney's Docket No. 1005950-000833

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	
Shenggao Liu et al.	Group Art Unit: 2811
Application No.: 10/622,046	Examiner: ORI NADAV
Filed: July 16, 2003	Appeal No.: _____
For: HETEROATOM-CONTAINING DIAMONDOID TRANSISTORS	

APPEAL BRIEF

Mail Stop APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is from the decision of the Primary Examiner dated December 5, 2005 finally rejecting claims 1-34 and 39-42, which are reproduced as the Claims Appendix of this brief, and further to the Notice of Appeal filed June 2, 2006.

☐ A check covering the ☐ $ 250 ☐ $ 500 Government fee is filed herewith.

☒ Charge ☐ $ 250 ☒ $ 500 to Credit Card. Form PTO-2038 is attached.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§41.20(b)(2), 1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800.

I. Real Party in Interest

Chevron USA Inc., a corporation organized and existing under and by virtue of the laws of the Commonwealth of Pennsylvania, and having a regular and established place of business at San Ramon, state of California, which is the real party in interest, and is the assignee of record of Application No. 10/622,046.

II. Related Appeals and Interferences

The Appellants' legal representative, or assignee, does not know of any other appeal or interference which will affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 35-38 have previously been canceled. Claims 1-34 and 39-42 are pending, rejected and presently appealed.

IV. Status of Amendments

No claim amendments were filed subsequent to the final rejection.

V. Summary of Claimed Subject Matter

The subject matter of the independent claims is mapped below.

According to embodiments of the present invention, diamondoids are isolated from petroleum feedstocks, and heterodiamondoids are synthesized by substitutionally positioning heteroatoms onto host carbon positions of the diamond lattice. These heteroatoms in general come from groups III and V of the periodic table, and in general, comprise electron-withdrawing and electron-donating entities, respectively. Examples of group III electron-withdrawing impurity atoms include boron and aluminum. Examples of group V electron-donating impurity atoms include

nitrogen, phosphorus, and arsenic, although lithium and sodium may be used as well. (Page 5 of the specification, lines 3-10).

Once the heterodiamondoids containing electron-donating and electron-withdrawing heteroatoms have been synthesized, the heterodiamondoids may be fabricated into *n* and *p*-type materials. These *n* and *p*-type materials may be fabricated using a variety of techniques, including chemical vapor deposition (CVD), polymerization, crystallization, and the like. Using CVD techniques, heterodiamondoids may be injected into a CVD reactor to nucleate diamond growth, whereby the heteroatom of the heterodiamondoid is included into a growing diamond film without the damage created by implantation methods. In an alternative embodiment, heterodiamondoids may be functionalized with polymerizable substitutents to link adjacent diamondoids and/or heterodiamondoids together. The linking groups may be short lengths (oligomers or even monomers) of conductive polymers known in the art. Heterodiamondoids may also be used as "molecular crystals," where arrangements of diamondoid and heterodiamondoid molecules are packed together in a "superlattice," and where the diamondoids are held together by van der Waals forces. (Page 5 of the specification, lines 11-24).

The *n* and *p*-type diamondoid-containing materials may then be used in semiconductor devices that utilize *p-n* junctions known in the art. Such devices include rectifying diodes, bipolar junction transistors, and field effect transistors. (Page 5 of the specification, lines 25-27).

Independent claim 1 of the present application relates to an *n*-type diamondoid material comprising an electron donating heteroatom. (Page 5 of the specification, lines 11-14).

Independent claim 12 of the present application relates to a *p*-type diamondoid material comprising an electron withdrawing heteroatom. (Page 5 of the specification, lines 11-14).

Independent claim 23 of the present application relates to an electrical *p-n* junction comprising a *p*-type diamondoid material and an *n*-type diamondoid material. (Page 5 of the specification, lines 25-27).

Independent claim 27 of the present application relates to a diamondoid transistor comprising an *n*-type heterodiamondoid material and a *p*-type diamondoid material. (Page 37 of the specification, beginning at line 19 to page 39, line 3).

Independent claim 39 of the present application relates to a diamondoid transistor comprising electrically conducting regions in electrically insulating regions. The electrically conducting regions of the transistor comprise *n*- and *p*-type heterodiamondoid materials and the electrically insulating regions of the transistor comprise undoped diamondoid materials. (Page 39 of the specification, lines 11-22).

VI. Grounds of Rejection to be Reviewed on Appeal

A. Claims 1-3 and 12-14 are rejected under the judicially-created doctrine of obviousness type double patenting as being unpatentable over claims 13 and 19 of copending Application No. 10/622,130. This application has now issued as U.S. Patent No. 7,049,374, issuing on May 23, 2006.

B. Claims 23-34 and 39-42 are rejected under the judicially-created doctrine of obviousness type double patenting as being unpatentable over claims 13 and 19 of copending Application No. 10/622,130 taken in view of Davis (*Diamond Films and Coatings*, Chapter 8, 1993, Noyes Publications, Park Ridge, NJ, USA). As noted above, this application has now issued as U.S. Patent No. 7,049,374.

C. Claims 1-34 and 39-42 are provisionally rejected under the judicially-created doctrine of obviousness type double patenting as being unpatentable over claims 1 and 6-8 of copending Application No. 10/621,956 taken in view of Davis (*Diamond Films and Coatings*, Chapter 8, 1993, Noyes Publications, Park Ridge, NJ, USA).

D. Claims 1-7, 12-18, 23-34 and 39-42 stand rejected under 35 U.S.C. §102(b) as being anticipated by Davis (*Diamond Films and Coatings*, Chapter 8, 1993, Noyes Publications, Park Ridge, NJ, USA). In the rejection, the Examiner notes that Davis teaches on pages 384 and 395-402 an electrical p-n junction in a diamondoid transistor comprising a p-type and n-type diamondoid materials. The

Examiner also states that Davis teaches a heteroatom positioned on a lattice site of the diamond crystal, and thus the term "diamondoid" is inherent in Davis's structure.

E. Claims 9-11 and 20-22 stand rejected under 35 U.S.C. §103 as being unpatentable over Davis taken in view of Chapman (U.S. Patent No. 5,053,434). In rendering the rejection, the Examiner states that Davis teaches substantially the entire claimed structure except the n-type diamondoid material is a polymerized heterodiamondoid. Chapman, the secondary reference, is applied by the Examiner to show an n-type diamondoid material being a polymerized heterodiamondoid.

F. Claims 8 and 19 are rejected under 35 35 U.S.C. §103 as being unpatentable over Davis taken in view of Ashjian et al (U.S. Patent No. 5,400,427). In the rejection, the Examiner states that Davis teaches substantially the entire claimed structure except a diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane and undecamantane. Ashjian et al (the secondary reference) is stated by the Examiner to teach a diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane and undecamantane.

VII. Argument

Appellants respectfully disagree with the rejections of claims 1-34 and 39-42. It is submitted by appellants that the double patenting rejections are improper and should be withdrawn. It is also submitted that the art rejections under §§102 and 103 are improper and ought to be withdrawn. Reversal of these rejections is therefore respectfully requested for the following reasons.

A. Double patenting rejection of claims 1-3 and 12-14 over copending Application No. 10/622,130

As noted previously, the foregoing application has now issued as U.S. Patent No. 7,049,374. Therefore, the rejection is no longer provisional. Nevertheless, appellants respectfully disagree with the Examiner's rejection.

The Examiner alleges that although the conflicting claims are not identical, they are not patentably distinct form each other because ***both inventions recite*** an n-type and p-type diamondoid material comprising heteroatoms of various elements. Appellants point out, however, that the claims of the issued '374 patent do ***not*** recite either "n-type" or "p-type" diamondoid materials. Accordingly, Appellants respectfully submit that the claims are patentably distinct and respectfully request that this rejection be reversed.

B. Double patenting rejection of claims 23-34 and 39-42 over copending Application No. 10/622,130 taken in view of Davis

Appellants respectfully disagree with the present double patenting rejection for the following reasons.

The Office Action states that

> Claims 13 and 19 of copending Application No. 10/622,130 teach substantially the entire claimed structure, as recited in claims 23-34 and 39-42, except using the n-type and p-type diamondoid materials in practical application such as transistors and diodes. Davis teaches in section 6.0 using the n-type and the p-type diamondoid materials in practical applications such as transistors and diodes.

Appellants point out that the claims of the '374 patent do not recite the following:

a) an "electrical *p-n* junction", a "*p*-type diamondoid material", or an "*n*-type diamondoid material", as recited in claim 23;

b) a "diamondoid transistor", an "*n*-type heterodiamondoid material", or a "*p*-type diamondoid material", as recited in claim 27; or

c) a "diamondoid transistor", "electrically conducting regions", "*n* and *p*-type heterodiamondoid materials", "electrically insulating regions", or "undoped diamondoid materials", as recited in claim 39.

Appellants further point out that Davis relates to electronic applications of ***diamond*** films and coatings, ***not*** applications of ***diamondoid*** materials. This difference is significant as "diamond" and "diamondoids" are recognized as different chemical materials, with significantly different characteristics. For example, the base

carbon-carbon bond lengths in diamondoids are somewhat longer than those in a diamond. Also, different diamondoids have different melting points where the molecular species remains intact. No C-C bonds are broken. Diamondoids even show various solid phase transitions. Diamond has no properties like this. The C-C bonds of diamond break upon melting. A diamondoid can be vaporized and remain intact, whereas a diamond cannot.

The disclosure of diamond in Davis, therefore, does not and cannot suggest the use of a diamondoid. The two are recognized as distinct chemical materials as they are significantly different in many respects.

Accordingly, reversal of this rejection is respectfully requested.

C. Double patenting rejection of claims 1-34 and 39-42 over claims 1 and 6-8 of copending Application No. 10/621,956 taken in view of Davis

Appellants respectfully disagree with this rejection for the following reasons, and therefore request reversal.

The Office Action states that

> Claims 1 and 6-8 of copending Application No. 10/621,956 teach substantially the entire claimed structure, as recited in claims 1-34 and 39-42, except using an n-type and a p-type diamondoid materials in practical applications such as transistors and diodes. Davis teaches in section 6.0 using an n-type and a p-type diamondoid materials in practical applications such as transistors and diodes.

Appellants point out that claims 1 and 6-8 of the '956 application ("Optical uses of diamondoid-containing materials") do not recite the following:

a) an "*n*-type diamondoid material" or an "electron-donating heteroatom", as recited in claim 1;

b) a "*p*-type diamondoid material" or an "electron-withdrawing heteroatom", as recited in claim 12;

c) an "electrical *p*-*n* junction", a "*p*-type diamondoid material", or an "*n*-type diamondoid material", as recited in claim 23;

d) a "diamondoid transistor", an "*n*-type heterodiamondoid material", or a "*p*-type diamondoid material", as recited in claim 27; or

e) a "diamondoid transistor", "electrically conducting regions", "*n* and *p*-type heterodiamondoid materials", "electrically insulating regions", or "undoped diamondoid materials", as recited in claim 39.

Again, Appellants further point out that Davis relates to electronic applications of ***diamond*** films and coatings, ***not*** applications of ***diamondoid*** materials.

D. Rejection of claims 1-7, 12-18, 23-34 and 39-42 under 35 U.S.C. §102(b) as being anticipated by Davis

As noted above, Davis relates to electronic applications of ***diamond*** films and coatings. For the reasons discussed above, this is a significant difference, as diamond and diamondoids are recognized as distinct chemical materials that are very different in many respects.

In contrast, embodiments of the presently claimed invention are directed in general toward *n* and *p*-type materials fabricated from heteroatom-containing ***diamondoids***. (Page 1, Lines 15-18). As explained in the present specification, the term "diamondoids" refers to substituted and unsubstituted caged compounds of the adamantane series including adamantane, diamantane, triamantane, tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, undecamantane, and the like, including all isomers and stereoisomers thereof. (Page 13, Lines 12-15). Also as defined in the present specification, the term "heterodiamondoid" refers to a diamondoid (as defined above) that contains a heteroatom typically substantially positioned on a lattice site of the diamond crystal structure. A heteroatom is an atom other than carbon, and according to present embodiments may be nitrogen, phosphorus, boron, aluminum, lithium, and arsenic. "Substitutionally positioned" means that the heteroatom has replaced a carbon host atom in the diamond lattice. Although most heteroatoms are substitutionally positioned, they may in some cases be found in interstitial sites as well. As disclosed in the present specification, feedstocks that contain large proportions of lower diamondoids and lower, but significant amounts of higher diamondoids, include, for example, natural gas condensates and refinery streams resulting from cracking, distillation, coking processes, and the like ("Isolation of diamondoids from petroleum feedstocks"). (Page 16, line 28 – page 17, Line 3).

To anticipate a claimed invention under §102, a reference must teach each and every element of the claimed invention. *See Lindeman Machinenfabrik GmbH v. American Hoist and Derrick Company*, 221 USPQ 481, 485 (Fed. Cir. 1984). MPEP §2131.

As noted above, Davis relates to electronic applications of ***diamond*** films and coatings. It is respectfully submitted that in no way does Davis disclose or suggest ***diamondoid*** materials. Diamond is a material significantly different from diamondoids and recognized as such. Their properties are significantly different as discussed above.

Therefore, in no way does Davis disclose or suggest diamondoid materials comprising an electron-donating heteroatom. As defined in the present specification and provided above, diamondoids are materials distinct from diamonds. As Davis does not disclose each and every element of claims 1-7, 12-18, 23-34, and 39-42, it cannot anticipate these claims.

For at least the above-noted reasons, reversal of this rejection under 35 U.S.C. § 102(b) is respectfully requested.

E. Rejection of claims 9-11 and 20-22 under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Chapman

As noted above, Davis relates to electronic applications of ***diamond*** films and coatings, rather than applications of ***diamondoid*** materials. These materials are significantly different.

Chapman is cited as teaching "an n-type diamondoid material being a polymerized heterodiamondoid." (Office Action, page 7). Chapman relates to polymeric compositions comprising at least three monomers bonded through octahedrally disposed nonmetallic atoms of the monomers. Chapman discloses that adamantane exemplifies the skeletal structure of such monomers. Chapman further discloses that the adamantine polymers may include pendant substituent groups replacing one or more hydrogens of the monomer units. Appellants respectfully submit that Chapman does not disclose or suggest replacing a carbon atom in the adamantane lattice with a heteroatom. Moreover, appellants respectfully submit that

Chapman does ***not*** disclose an n-type diamondoid material or polymerized ***heterodiamondoids***, as defined above.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP § 2143.

Appellants respectfully submit that there is no suggestion or motivation, either in Davis or Chapman or in the knowledge generally available to one of ordinary skill in the art, to combine Davis and Chapman. Appellants further respectfully submit that there is no reasonable expectation of success in combining Davis and Chapman. As provided above, Davis relates to electronic applications of ***diamond*** films and coatings. In contrast, Chapman relates to polymeric compositions comprising at least three monomers bonded through octahedrally disposed nonmetallic atoms of the monomers, with adamantane exemplifying these monomers. Appellants respectfully submit that the adamantane polymeric compositions of Chapman are materials quite distinct from diamond films and coatings as disclosed in Davis. Accordingly, Appellants respectfully submit that there is no suggestion or motivation to combine Davis and Chapman and there is no reasonable expectation of success in doing so.

Moreover, appellants respectfully submit that even if there were some suggestion or motivation to combine Davis and Chapman and a reasonable expectation of success, Davis and Chapman, even when combined, do not disclose or suggest all the claim limitations. As noted above, Davis relates to electronic applications of ***diamond*** films and coatings, rather than applications of ***diamondoid*** materials. Also as described above, Chapman relates to polymeric compositions comprising at least three monomers bonded through octahedrally disposed nonmetallic atoms of the monomers, with adamantane exemplifying these monomers. However, appellants respectfully submit that Chapman does ***not*** disclose an n-type diamondoid material or polymerized ***heterodiamondoids***, as defined above.

Therefore, even if combined, Davis and Chapman do not disclose or suggest *n*-type diamondoid materials comprising an electron-donating heteroatom. Moreover, even if combined, Davis and Chapman do not disclose or suggest *n*-type diamondoid materials comprising an electron-donating heteroatom wherein the material is a polymerized heterodiamondoid. In addition, even if combined, Davis and Chapman do not disclose or suggest *p*-type diamondoid materials comprising an electron-donating heteroatom. Moreover, even if combined, Davis and Chapman do not disclose or suggest *p*-type diamondoid materials comprising an electron-donating heteroatom wherein the material is a polymerized heterodiamondoid.

For at least the above-noted reasons, reversal of this rejection under 35 U.S.C. §103(a) is respectfully requested.

F. Rejection of claims 8 and 19 under 35 U.S.C. §103(a) as being unpatentable over Davis in view of Ashjian et al

As noted above, Davis relates to electronic applications of ***diamond*** films and coatings, rather than applications of ***diamondoid*** materials.

Ashjian is cited as teaching "a diamondoid [is] selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane." Ashjian discloses a fiber optic cable assembly comprising at least one optical fiber and a grease in contact with the optical fiber, wherein the grease comprises a diamondoid component. (Abstract and claim 1). Ashjian further discloses that the diamondoid component of the grease are diamondoid compounds selected from methyl-substituted and ethyl-substituted adamantane, diamantane, and triamantane and Ashjian lists diamondoid compounds suitable for use in the grease composition, including methyl- and ethyl-substituted adamantanes, diamantanes, and triamantanes, and iso-tetramantane and anti-tetramantane. (Column 3, lines 3 1-36 and Table 2). Ashjian does ***not*** disclose or suggest heterodiamondoids, as defined in the present specification and provided above. In addition, Ashjian does ***not*** disclose or suggest any pentamantanes, hexamantanes, heptamantanes, octamantanes, nonamantanes, decamantanes, or undecamantanes.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP § 2143.

Appellants respectfully submit that there is no suggestion or motivation, either in Davis or Ashjian or in the knowledge generally available to one or ordinary skill in the art, to combine Davis and Ashjian. Appellants further respectfully submit that there is no reasonable expectation of success in combining Davis and Ashjian. As provided above, Davis relates to electronic applications of diamond films and coatings. In contrast, Ashjian discloses a fiber optic cable assembly comprising at least one optical fiber and a grease in contact with the optical fiber wherein the grease comprises a diamondoid component, wherein the diamondoid components are selected from methyl-substituted and ethyl-substituted adamantane, diamantane, and triamantane. Appellants respectfully submit that the grease filler material comprising a diamondoid component of Ashjian is quite distinct from diamond films and coatings as disclosed in Davis, as discussed above. Accordingly, Appellants respectfully submit that there is no suggestion or motivation for the skilled artisan to combine Davis and Ashjian and there is no reasonable expectation of success in doing so.

Moreover, Appellants respectfully submit that even if there were some suggestion or motivation to combine Davis and Ashjian and a reasonable expectation of success, Davis and Ashjian even when combined do not disclose or suggest all the claim limitations. As noted above, Davis relates to electronic applications of ***diamond*** films and coatings, rather than applications of ***diamondoid*** materials. Also as described above, Ashjian relates to a fiber optic cable assembly comprising at least one optical fiber and a grease in contact with the optical fiber wherein the grease comprises a ***diamondoid*** component, wherein the diamondoid components are selected from methyl-substituted and ethyl-substituted adamantane, diamantane, and triamantane. However, appellants respectfully submit that Ashjian does ***not*** disclose an n-type diamondoid material comprising an electron-donating

heteroatom, p-type diamondoid materials comprising an electron-donating heteroatom, ***heterodiamondoids*** (as defined in the present specification and provided above), or heterodiamondoids selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, or undecamantane.

Therefore, even if combined, Davis and Ashjian do not disclose or suggest *n*-type diamondoid materials comprising an electron-donating heteroatom. Moreover, even if combined, Davis and Ashjian do not disclose or suggest *n*-type diamondoid materials comprising an electron-donating heteroatom wherein the diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, or undecamantane. In addition, even if combined, Davis and Ashjian do not disclose or suggest *p*-type diamondoid materials comprising an electron-donating heteroatom. Moreover, even if combined, Davis and Ashjian do not disclose or suggest *p*-type diamondoid materials wherein the diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, or undecamantane.

For at least the above-noted reasons, reversal of this rejection under 35 U.S.C. §103(a) is respectfully requested.

VIII. Claims Appendix

See attached Claims Appendix for a copy of the claims involved in the appeal.

IX. Evidence Appendix

See attached Evidence Appendix

X. Related Proceedings Appendix

See attached Related Proceedings Appendix

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date Jan. 3, 2007

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VIII. CLAIMS APPENDIX

The Appealed Claims

1. An *n*-type diamondoid material comprising an electron-donating heteroatom.

2. The *n*-type diamondoid material of claim 1, wherein the electron-donating heteroatom is a group V element.

3. The *n*-type diamondoid material of claim 1, wherein the electron-donating heteroatom is selected from the group consisting of nitrogen, phosphorus, and arsenic.

4. The *n*-type diamondoid material of claim 1, wherein the material comprises an aza-diamondoid.

5. The *n*-type diamondoid material of claim 1, wherein the electron-donating heteroatom occupies a substitutional site on the diamond lattice.

6. The *n*-type diamondoid material of claim 1, wherein the electron-donating heteroatom is sp^3-hybridized in the diamond lattice.

7. The *n*-type diamondoid material of claim 1, wherein the diamondoid is selected from the group consisting of adamantane, diamantane, and triamantane.

8. The *n*-type diamondoid material of claim 1, wherein the diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane.

9. The *n*-type diamondoid material of claim 1, wherein the material is a polymerized heterodiamondoid.

10. The polymerized heterodiamondoid material of claim 9, further including a metal atom to enhance electrical conductivity.

11. The polymerized heterodiamondoid material of claim 10, wherein the metal is gold.

12. A *p*-type diamondoid material comprising an electron-withdrawing heteroatom.

13. The *p*-type diamondoid material of claim 12, wherein the electron-withdrawing heteroatom is a group III element.

14. The *p*-type diamondoid material of claim 12, wherein the electron-withdrawing heteroatom is selected from the group consisting of boron and aluminum.

15. The *p*-type diamondoid material of claim 12, wherein the material comprises a boro-diamondoid.

16. The *p*-type diamondoid material of claim 12, wherein the electron withdrawing heteroatom occupies a substitutional site on the diamond lattice.

17. The *p*-type diamondoid material of claim 12, wherein the electron withdrawing heteroatom is sp^3-hybridized in the diamond lattice.

18. The *p*-type diamondoid material of claim 12, wherein the diamondoid is selected from the group consisting of adamantane, diamantane, and triamantane.

19. The *p*-type diamondoid material of claim 12, wherein the diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane.

20. The *p*-type diamondoid material of claim 12, wherein the material is a polymerized heterodiamondoid.

21. The polymerized heterodiamondoid material of claim 20, further including a metal atom to enhance electrical conductivity.

22. The polymerized heterodiamondoid material of claim 21, wherein the metal is gold.

23. An electrical *p*-*n* junction comprising a *p*-type diamondoid material and an *n*-type diamondoid material.

24. The *p*-*n* junction of claim 23, wherein the *n*-type diamondoid material is aza-heterodiamondoid.

25. The *p*-*n* junction of claim 23, wherein the *n*-type diamondoid material is phospho-heterodiamondoid.

26. The *p*-*n* junction of claim 23, wherein the *p*-type diamondoid material is boro-heterodiamondoid.

27. A diamondoid transistor comprising an *n*-type heterodiamondoid material and a *p*-type diamondoid material.

28. The diamondoid transistor of claim 27, wherein the transistor comprises an *n*-*p*-*n* field effect transistor.

29. The diamondoid transistor of claim 27, wherein the transistor comprises a *p*-*n*-*p* field effect transistor.

30. The diamondoid transistor of claim 27, wherein the *n*-type diamondoid material is aza-heterodiamondoid.

31. The diamondoid transistor of claim 27, wherein the *n*-type diamondoid material is phospho-heterodiamondoid.

32. The diamondoid transistor of claim 27, wherein the *p*-type diamondoid material is boro-heterodiamondoid.

33. The diamondoid transistor of claim 27 further comprising a source, gate, and drain, wherein the source and drain are frabricated from the *n*-type heterodiamondoid material, and the gate is fabricated from the *p*-type diamondoid material.

34. The diamondoid transistor of claim 27 further comprising a source, gate, and drain, wherein the source and drain are frabricated from the *p*-type heterodiamondoid material, and the gate is fabricated from the *n*-type diamondoid material.

39. A diamondoid transistor comprising a substantially single material, the transistor comprising electrically conducting regions and electrically insulating regions, wherein:

the electrically conducting regions of the transistor comprise *n* and *p*-type heterodiamondoid materials; and

the electrically insulating regions of the transistor comprise undoped diamondoid materials.

40. The transistor of claim 39, wherein the *n*-type diamondoid material comprises aza-heterodiamondoid.

41. The transistor of claim 39, wherein the *n*-type diamondoid material comprises phospho-heterodiamondoid.

42. The transistor of claim 39, wherein the *p*-type diamondoid material comprises boro-heterodiamondoid.

IX. EVIDENCE APPENDIX

None

Evidence Appendix - 1

X. RELATED PROCEEDINGS APPENDIX

None